Remarks/Arguments

Claims 1-14 are currently pending in the instant application.

Applicant has included a listing of the claims as they were amended at the time of national entry, via a preliminary amendment filed on March 25, 2005. The claims are **not** currently amended. Although the Official Action mailed on October 5, 2006 indicates that it is responsive to the communication filed on March 25, 2006, Applicant notes that the claims that are appended at the end of the Official Action still appear in multiply dependent form. Applicant respectfully requests an acknowledgement to the effect that the previous amendments to claims 4, 13 and 14 have been entered, and that claims 4, 13 and 14 currently of record are not in multiply dependent form.

Claim Rejections – 35 USC § 103

Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Osborne et al. (US 4,485,307):

Applicant respectfully traverses the rejection of claims 1-14 under 35 U.S.C. 103(a). To rely on a reference under 35 U.S.C. 103, it must be **analogous** prior art. More particularly, the reference must either be in the field of Applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned. Osborne et al. states at col. 1, lines 8-11 "this invention relates to gamma ray imaging devices and, particularly, to medical diagnostic devices for obtaining first-order focused images of internal organs using short-lived, positron emitting, radioisotopes." The cited reference discloses an apparatus including a conversion medium formed of a high-density metal in a crossed mesh pattern. The conversion medium captures high-energy gamma rays, which are produced when radioisotopes decay after being injected into a patient undergoing a diagnostic procedure. A Compton electron or photoelectron is displaced when the gamma ray is captured, and enters into an ionizable gas within the space between the mesh wires. An electrical field gradient is applied such that "ionization events" (i.e. electrons) can pass in a linear manner through the conversion medium and

their position recorded by conventional spatial position detection chamber techniques. First-order focusing is achieved using two detectors, located one each on opposite sides of the radioactive source. The very precise spatial position detection of the ionization events, in combination with the first-order focusing mechanism, supports stereoscopic imaging of internal organs.

In contrast, the problem that confronted the inventor named in the instant application relates to the analytical separation of different types of ions, one from another, in a mixture comprising a plurality of ion types. The problem that is addressed is identified clearly in the preamble of claims 1 and 11 of the instant application, which state "an apparatus for **separating** ions." Furthermore, it is stated at independent claim 1 that "ions propagating along a direction that is transverse to both the first length and the second length are separated in the portion of the analytical gap between the outer surface of the first electrode portion and the outer surface of the adjacent second electrode portion."

Applicant respectfully submits that the Osborne et al. reference does not constitute analogous prior art, and therefore the Examiner has failed to establish a *prima facie* case of obviousness. In particular, the cited reference is not reasonably pertinent since it not only belongs to a different field of endeavor, but also because the matter with which it deals would **not** logically have commended itself to the inventor's attention in considering his problem. Applicant can imagine no logical reason to consider a reference that teaches merely a high-density metal in a crossed mesh pattern as a conversion medium for capturing gamma rays, which are emitted from decaying radioisotopes injected into a patient that is undergoing a medical diagnostic procedure, when attempting to solve the problem of effecting analytical separation of ions from a complex mixture in the gas phase. At best, the apparatus that is disclosed by Osborne et al. bears a vague structural resemblance to some of the embodiments that are claimed at claims 1-14 of the instant application. That being said, the function and effect are completely different and unrelated to the problem that is solved by the invention as claimed at claims 1-14 of the instant application. It is also worth noting that Osborne et al. does not specifically teach "the pulling and the pushing of the ions in a specified direction" as is asserted at page 3 of the

Official Action mailed on October 5, 2006. Rather, Osborne et al. teaches ejection of Compton electrons or photoelectrons when a high-energy gamma ray is captured in the conversion medium (see col. 3, lines 40-51). At col. 3, lines 52-58, Osborne et al. make reference to amplification of the Compton electrons using an ionizable gas within the spaces of the conversion medium. The Examiner seems to have **inferred** that ions are produced during amplification of the Compton electrons, although this is not taught explicitly in the Osborne et al. reference. Furthermore, Osborne et al. teaches at col. 4, lines 5-9 "essentially, by measuring the difference in time between the arrival of the ionization events (i.e. **drifted electrons**) at the position detector chambers of each camera, first-order focusing of the radiation source may be obtained." This vague concept of "the arrival of the ionization events" is not described in sufficient detail to allow anyone of skill in the art to infer that ions are actually pulled and pushed in a specified direction. In fact, it seems quite clear that the "ionization events" relate to **electrons** rather than ions.

Accordingly, the Osborne et al. reference does not constitute analogous prior art, and therefore the rejection of claims 1-14 under 35 U.S.C. 103(a) is improper. Favorable consideration is kindly requested.

Applicant further submits that the proposed modification does not teach each and every feature of the instant invention in as complete detail as is claimed at claim 1. In particular, Osborne et al. teaches two series of parallel cathode wires 28, 32 sandwiching a series of parallel anode wires 30 (reference numerals as used at page 2 of the Official Action mailed on October 5, 2006). Since there is only a single series of parallel cathode wires 28, a single series of parallel cathode wires 32 and a single series of parallel anode wires 30, Applicant respectfully submits that Osborne et al. neither teaches nor suggests the features "a plurality of second electrode portions **interleaved in a repeating sequence** with the plurality of first electrode portions." Clearly, it is impossible to define an interleaved repeating sequence since there is only a single series of each type of the wires 28, 30 and 32.

Applicant further submits that Osborne et al. actually teaches away from the proposed modification. In particular, Osborne et al. teaches at col. 4, lines 64-66 "a graded

electric potential is formed between the stacks 16, 18, 20 and ground by a high voltage source 22 and resistors 24 and 26." At col. 5, lines 21-28, Osborne et al. further teach "unless the electrons thrown out by the converting wires 20 are collected **quickly**, diffusion of the electrons will reduce resolution. The creation of an electrostatic field within housing 12, with field force lines perpendicular to the spatial position sensing wires 28 will cause the electrons to drift **quickly** towards wires 28 thus following the radiation trajectory path and, thereby, improving image resolution." Osborne et al. also teaches that improved resolution is realized when the applied electric field within housing 12 causes the electrons to drift **quickly** toward wires 28. In contrast, as is stated at paragraph [0035] of the instant application, the application of an asymmetric waveform and a direct current potential to the electrodes results in a focusing region surrounding each one of the rods to which the asymmetric waveform is applied. The following is taken from paragraph [0037] of the instant application, in order to demonstrate the motion of the ions of interest when an asymmetric waveform and direct current voltage are applied to the electrode portions as claimed at claims 1-14 of the instant application, in which the reference numerals refer to elements of the drawings as originally filed in the instant application.

> "In the absence of a gas flow through the plurality of rods 20, the ions are expected to migrate to and collect within the focus regions 28 around the rods 22 to which the DV and CV are applied. Moreover, the ions become distributed at all locations equally around the circumference of the focus region 28. Accordingly, a flow of a gas 30 is provided through the analytical gap 26 between the rods, to transport the ions through the analytical gap 26 and toward the ion outlet 18. The introduction of a flow of gas 30 results in one of two possible changes to the distribution of ions within the plurality of rods 20, depending upon the rate of the flow of a gas. At low flow rates, the ions are directed around the circumference of the rods 22 following the curvature of the focus region 28. In effect, the flow of a gas 30 pushes the ions predominantly to the downstream side of the rods 22. This is possible because there are no barriers to motion of the ions around the focus region 28. At higher gas flow rates, the ions are no longer constrained to the focus regions 28, but instead are pulled out of the focus region 28 by the movement of the flow of a gas 30. Advantageously, the gas flow 30 carries selectively transmitted ions away from the plurality of rods 20 and toward the ion outlet 18."

Very clearly, the application of an asymmetric waveform and a direct current voltage (as claimed at claims 1-14) results in the ions being collected around the electrodes, and being carried toward the ion outlet predominantly under the influence of

the flow of a carrier gas through the apparatus. This mechanism for transporting ions tends to hold back the ions within the focus regions around the electrodes and thereby causes the ions to move **less quickly** toward the ion outlet. Osborne et al. clearly teaches that image resolution is reduced unless the electrons drift **quickly** toward the wires 28. Accordingly, Osborne et al. teaches away from applying any electric potential to the electrodes which would result in an electric field being established that causes the "ionization events (i.e. electrons)" to drift more slowly toward the wires 28. For at least this reason, one of skill in the art would not have been motivated at the time the invention was made to modify the teachings of Osborne et al. as suggested, to apply an asymmetric waveform and a direct current voltage to any of the electrodes.

Claims 2-10 depend either directly or indirectly from believed allowable claim 1 and are also believed to be in proper condition for allowance. Favorable consideration is kindly requested.

Having regard to claim 11, Applicant has already stated *supra* the Osborne et al. reference does not constitute analogous prior art and therefore the Examiner has failed to establish a *prima facie* case of obviousness. Applicant respectfully submits that the rejection of claim 11 under 35 U.S.C. 103(a) is improper. Favorable consideration is kindly requested.

Applicant further submits that the proposed modification does not teach each and every feature of the instant invention in as complete detail as is claimed at claim 11. In particular, Osborne et al. states at col. 4, lines 60-62 "In Fig. 1, the gamma ray imaging device of our invention 10 is shown, having a **gas-tight housing** 12 and containing an ionizable gas." Inspection of Fig. 1 does not reveal the presence of "an inlet aperture defined within the first surface and an outlet aperture defined within the second surface" of the housing, as is recited at claim 11 of the instant application. Indeed, the Examiner has acknowledged at page 4 of the Official Action mailed on October 5, 2006 that the inlet aperture is not shown. Clearly, the apparatus that is disclosed by Osborne et al. is constructed with a **gas-tight housing** that contains a fixed amount of an ionizable gas, and does not include an inlet aperture and an outlet aperture as is claimed at claim 11.

Applicant respectfully submits that claim 11 is in proper condition for allowance. Favorable consideration is kindly requested.

Still having regard to claim 11, Applicant further submits that Osborne et al. actually teaches away from the proposed modification, as was discussed with reference to claim 1, *mutatis mutandis*. Briefly, one of skill in the art would not have been motivated at the time the invention was made to modify the teachings of Osborne et al. as suggested, to apply an asymmetric waveform and a direct current voltage to any of the electrodes, since the effect would be to slow down the transport of ions through the apparatus. Osborne et al. teaches that unless electrons drift quickly to wires 28, resolution is reduced. Accordingly, Osborne et al. teaches away from applying any electric potential to the electrodes which would result in an electric field being established that causes the "ionization events (i.e. electrons)" to drift more slowly toward the wires 28. For this reason, one of skill in the art would not have modified the teachings of Osborne et al. as suggested, to apply an asymmetric waveform and a direct current voltage to any of the electrodes. Favorable consideration is kindly requested.

Having regard to claim 12, Applicant respectfully submits that Osborne et al. teaches away from the feature "wherein the rod-shaped electrodes of the plurality of rod-shaped electrodes are arranged such that each rod-shaped electrode to which the asymmetric waveform voltage is applied has as its nearest neighbor a rod-shaped electrode to which only the direct current voltage is applied." In particular, Osborne et al. shows at Fig. 3 a series of n layers, each with m wires/per layer at the same voltage. Favorable consideration is kindly requested.

Having regard to claim 13, Applicant respectfully submits that Osborne et al. teaches away from the feature "wherein the inlet aperture is adapted for providing a flow of a gas into the housing, through the analytical gap and out of the outlet aperture, the flow of gas for transporting ions along the direction of travel that is transverse to the length." As discussed *supra,* Osborne et al. teaches a **gas-tight** housing, which precludes establishment of a gas flow introduced through an inlet aperture and out through an outlet aperture as claimed at claim 13. Favorable consideration is kindly requested.

Claim 14 is believed to be in proper condition for allowance for the same reasons that were discussed with reference to claim 13, *mutatis mutandis*. Favorable consideration is kindly requested.

Furthermore, claims 12-14 depend from believed allowable claim 11 and are also believed to be in proper condition for allowance. Favorable consideration is kindly requested.

Applicant looks forward to receiving favourable consideration of the instant application.

Please charge any additional fees required or credit any overpayment to Deposit Account No: 50-1142.

Respectfully submitted,

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